NextGen Opportunities to Improve V&V Practices

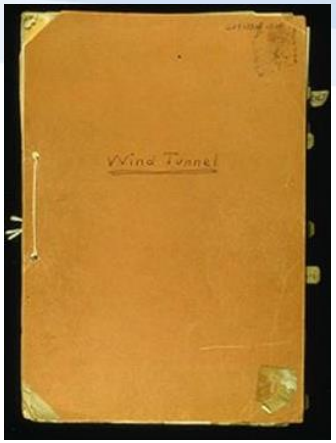
Current Challenges and Some Thoughts on Focus Areas

9th Annual FAA V&V Summit, Atlantic City, NJ
Natesh Manikoth, CSTA NAS Software
17th Sept, 2014

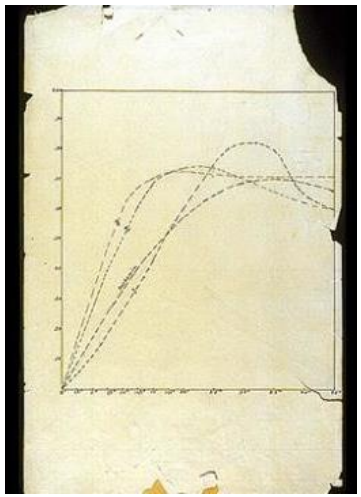
Motivation

- Do NAS Systems Accumulate Technical & Social Debt ?
- V&V and Measurement of Quality
- Can we have our own "Wind Tunnels” ?

“In the Fall of 1901, the Wright Brothers decided to begin a "series of experiments to accurately determine the amount and direction of the pressure produced on curved surfaces when acted upon by winds at the various angles from zero to ninety degrees." To do this, they built a wind tunnel.”



“Within a few months, the Wrights had the world's best collection of lift data. Years later, Orville reflected on the wind tunnel experiments and said, ‘I believe we possessed...more data on cambered surfaces, a hundred times over, than all of our predecessors put together.’”



Source: The Franklin Institute

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Where is the Wind Tunnel for the NAS ?

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Technical Debt

“**“Technical Debt”** refers to delayed technical work that is incurred when technical short cuts are taken, usually in pursuit of calendar- driven software schedules. Just like financial debt, some technical debts can serve valuable business purposes. Other technical debts are simply counterproductive. The ability to take on debt safely, track their debt, manage their debt, and pay down their debt varies among different organizations. Explicit decision making before taking on debt and more explicit tracking of debt are advised.”

Source: Managing Technical Debt - Best Practices White Paper
Steve McConnell, Chief Software Engineer, Construx Software Version 1, June 2008

Social Debt

““**Social Debt”** in software engineering informally refers to unforeseen project cost connected to a “suboptimal” development community. The causes of suboptimal development communities can be many, ranging from global distance to organisational barriers to wrong or uninformed socio-technical decisions (i.e., decisions that influence both social and technical aspects of software development)**.**”

Source: What Is Social Debt in Software Engineering?, Tamburri et al; ICSE 2013 Conference Proceedings

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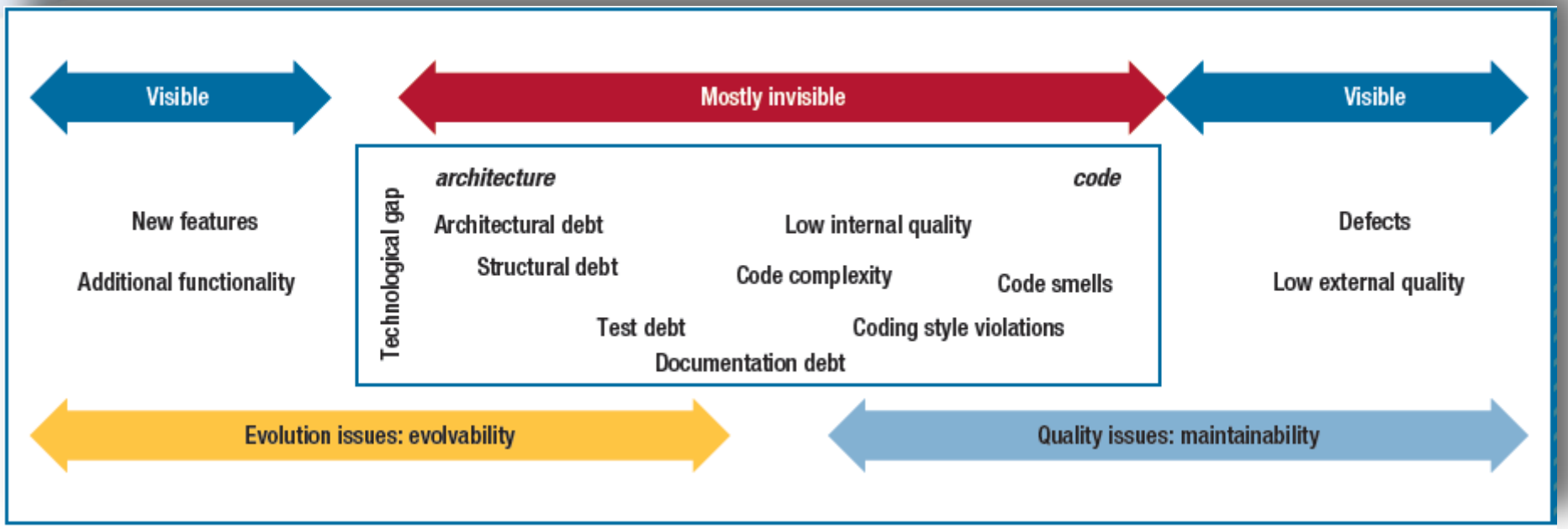
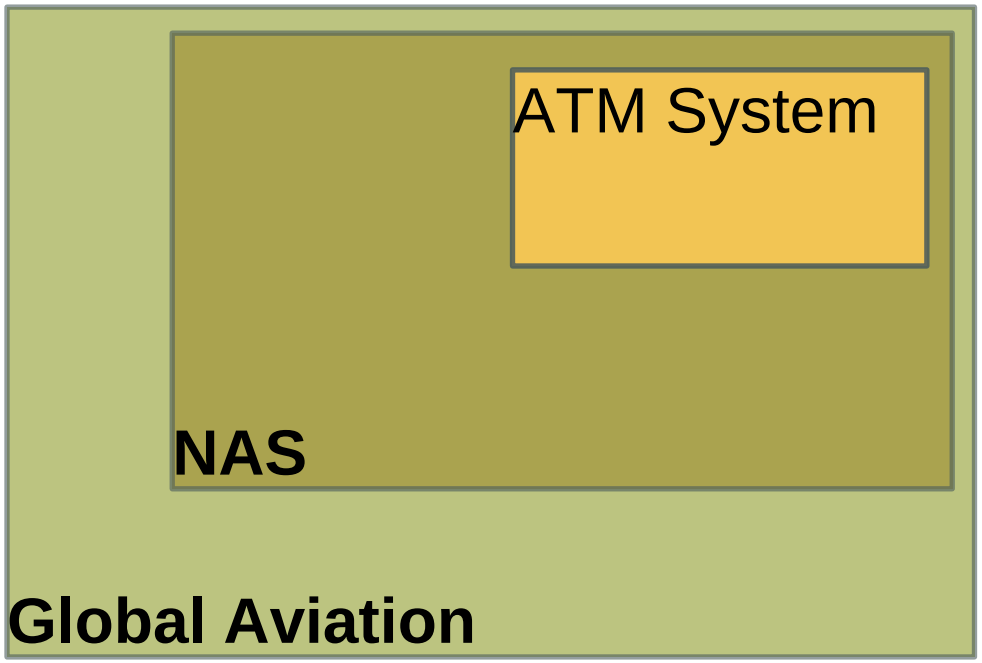


Source: Kruchten et al, Technical Debt: From Metaphor to Theory and Practice; IEEE Software Nov/Dec 2012

ATM/NAS/GLOBAL AVIATION



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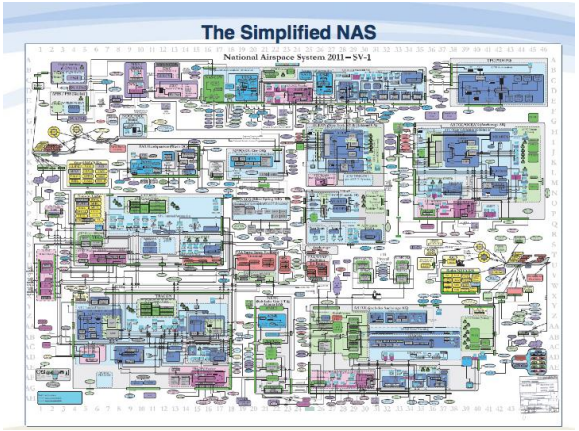
Role of V&V Community

“Simplicity is a great virtue but it requires hard work to achieve it and education to appreciate it. And to make matters worse: complexity sells better. “

E.W.Djikstra



Source: https://www.cs.utexas.edu/users/EWD/ewd08xx/EWD896.PDF

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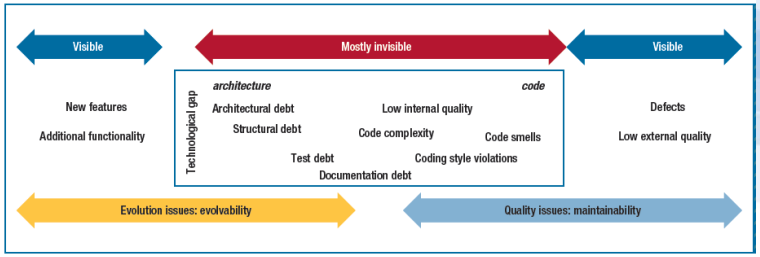
System & Software Quality

ISO/IEC 25010-2011



System/Software Product Quality

Functional Suitability	Performance Efficiency	Compatibility	Usability	Reliability	Security	Maintainability	Portability
Functional Completeness	Time-behavior	Co-existence	Appropriateness recognizability	Maturity	Confidentiality	Modularity	Adaptability
Functional Correctness	Resource Utilization	Interoperability	Learnability	Availability	Integrity	Reusability	Installability
Functional Appropriateness	Capacity		Operability	Fault Tolerance	Non-repudiation	Analyzability	Replaceability
			User error protection	Recoverability	Accountability	Modifiability	
			User interface aesthetics		Authenticity	Testability	
			Accessibility				

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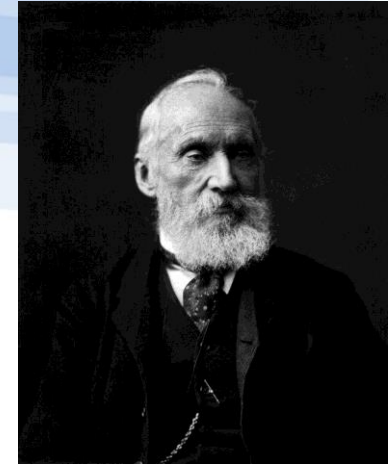

"To measure is to know."

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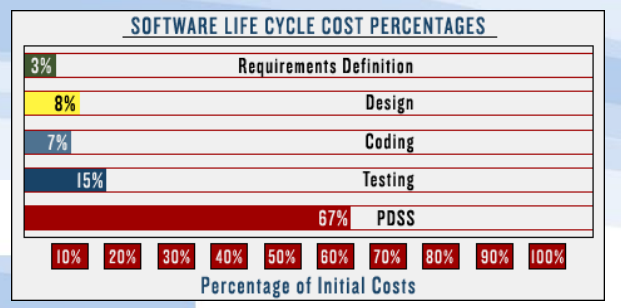
NextGen Opportunities



Top Seven Programs

As of: July 2014

Sep-13 · Dec-13 · Mar-14 · Apr-14 · Sep-14 · Dec-14 · Mar-15 · Jun-15 · Sep-15 · Dec-15 · 2016+

Communications

Data Communication (Data Comm)

- Initiate DCL Tower Trials: MEM Jan.2013 & EWR April 2013
- En Route Services FID October 2014
- Complete DCL Tower Service Operational Test & Evaluation (OT&E) Nov. 2015
- Complete DCL Tower Trials January 2016
- DCL Tower Service IOC Key Site (SLC) March 2016
- First Site IOC En Route Service 2019

NAS Voice System (NVS)

- Achieve Gov't Acceptance of two NVS Demo systems at contractor's facility
- Complete Initial Demonstrations March 2014
- NAS Qualification Final Investment Decision (FID) Sept.2014
- Begin ATC Task & Skills Analysis (TASA) Development Nov.2015
- Initiate OT&E Dec. 2016

Surveillance

Automatic Dependent Surveillance–Broadcast (ADS-B)

- Radio Infrastructure Complete March 2014
- NAS-wide Pilot Advisory Services (Traffic & Weather) April 2014
- Complete Final 24 of 24 En Route IOCs Sept. 2015
- Complete All Term. & Surf. IOCs 2019
- ADS-B Out Rule Compliance Jan. 2020

Automation

Terminal Automation Modernization and Replacement (TAMR)

- 1 ARTS IIIE IOC (Dallas – D10) April 2013
- Complete 3 ARTS IIE IOCs Sept. 2014
- Final ARTS IIIE IOC May 2016

Terminal Flight Data Manager (TFDM)

- Initial Investment Decision (IID) March 2014
- Surface Visualization Tool IOC at SCT April 2014
- Screening Info. Request (SIR) Release Sept 2014
- Final Investment Decision (FID) FY2015
- Contract Award FY2015
- Complete Key Site IOC 2017

En Route Automation Modernization (ERAM)

- Complete Final / 20th IOC September 2014
- Complete Final / 20th ORD March 2015

Integration

System Wide Information Management (SWIM)

- Complete NextGen Capabilities Package Sep.2013
- Complete SWIM Terminal Data Distribution System (STDDS) Implementation June 2014
- SWIM Segment 2B FID June 2015
- Complete Flight Data Publication IOC July 2015

Legend

- Activity is completed
- Activity is in progress
- Activity is at risk
- Activity is missed

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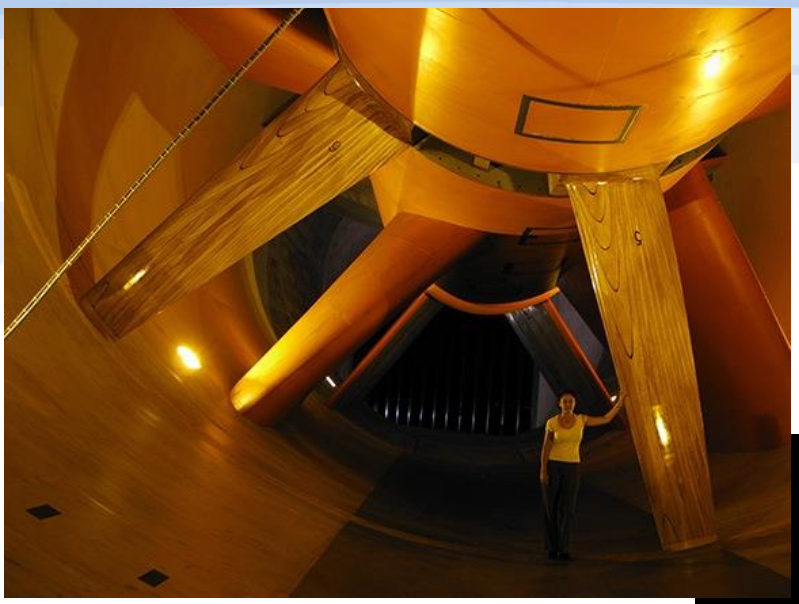

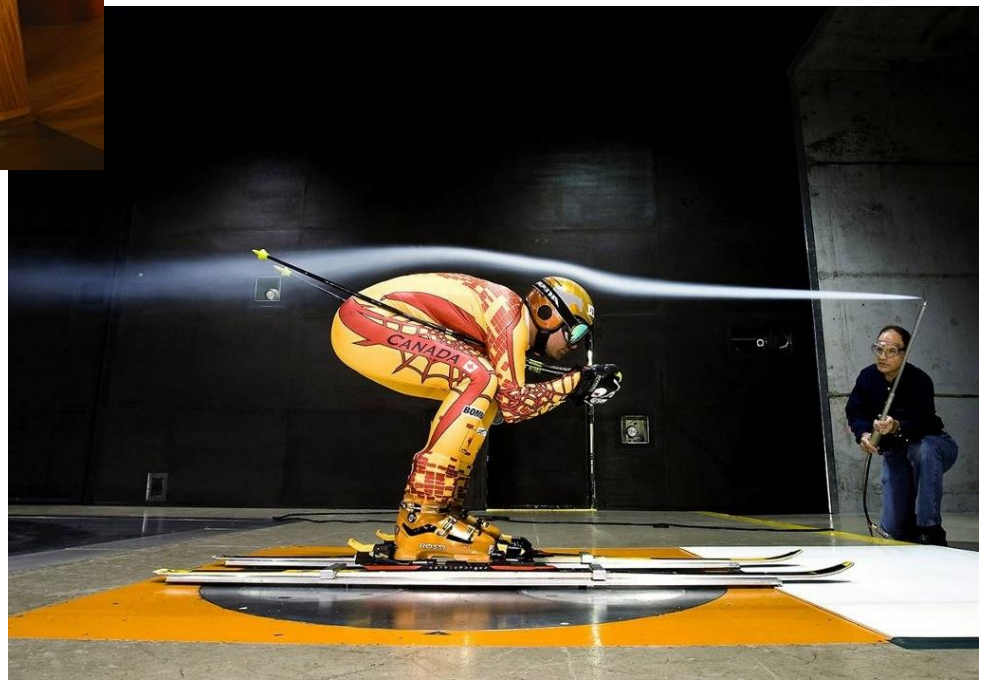
CANADA